



Twin Cities Metro Area Chloride Feasibility Study

Fall 2010 Hydraulics/WRE
Workshop
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Project Overview

- Gain a better understanding of the extent and magnitude of chloride contamination to surface waters in the 7 county Twin Cities Metropolitan Area (TCMA)
- Explore options & strategies for addressing chloride impairments
- Focused on Road Salt as primary source of chloride

Chloride Feasibility Study Team

- **Minnesota Pollution Control Agency (MPCA)**
 - Watershed Section
 - Monitoring Program
 - Stormwater Program
 - Standards Program
 - Education & Development
- **Minnesota Department of Transportation (Mn/DOT)**
- **Metropolitan Council (MCES)**
- **Board of Water and Soil Resources (BWSR)**
- **University of Minnesota, St. Anthony Falls Laboratory (SAFL)**
- **Wenck Associates, Inc.**

Report Outline

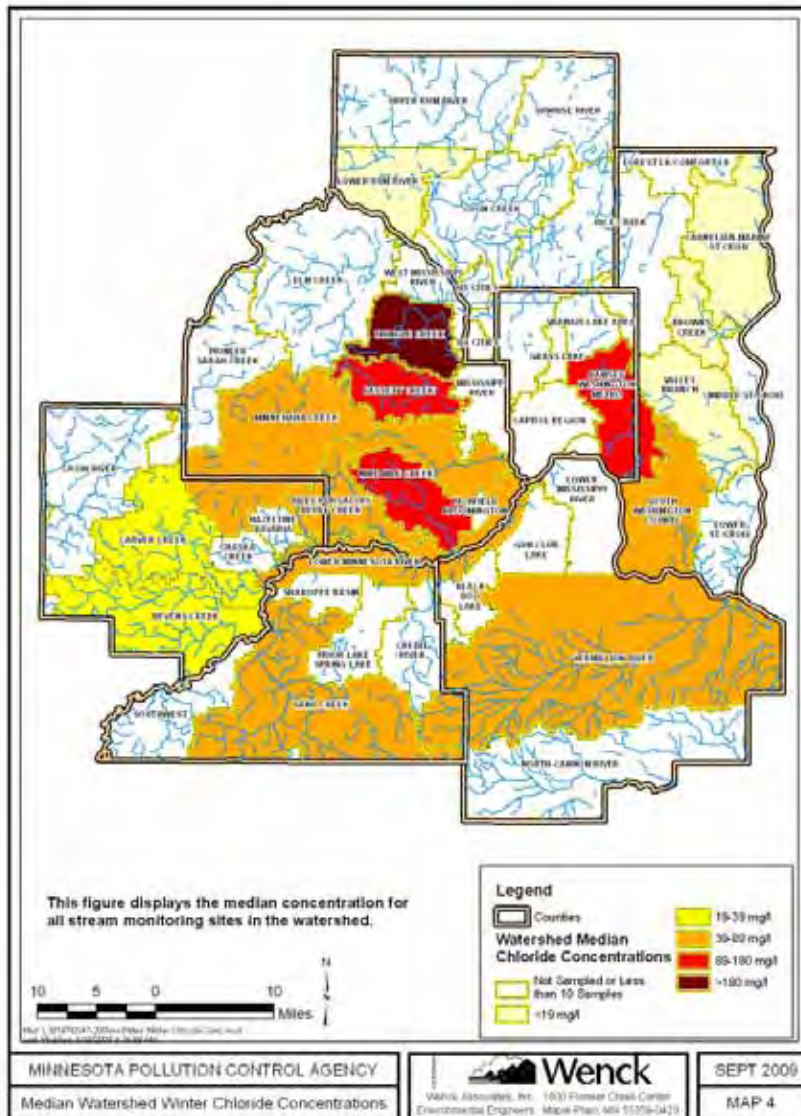
- Section 1 – Introduction
- Section 2 - Data Assessment
- Section 3 - Literature Review
- Section 4 - Existing TCMA De-Icing Practices and Relationship to Water Quality
- Section 5 - TCMA Chloride Potential Monitoring, Research, and Management Strategies
- Section 6 - Summary and Next Steps
- Appendices (10)

Data Assessment

- Focus is on the Metro Watershed Management Organization(WMO) scale
- Data retrieved from STORET (MPCA data storage), USGS and Met Council
- Roughly 35,700 chloride data points from Lakes, Streams & Groundwater



Stream Data



- Toxicity-based standard: Chronic standard is 230 mg/L and the maximum standard is 860 mg/L
- Majority of data values > than 230 mg/L (217/295) occur during the winter (Nov. - March)
- Chloride data is available from 27 of the 43 Metro watersheds
- Only 20% of the chloride data was collected during the winter period

Lakes Data

- Chloride levels are typically higher in deeper portions of the lake
- Water quality standard does apply to lakes – MPCA listed the first lakes on the 2010 impaired waters list
- 18 lakes (out of 211) have 1 or more data values >than the chronic standard
- Typically, higher chloride concentrations were found in lakes in the more developed core of the TCMA



Literature Review and Annotated Bibliography (Appendix G)

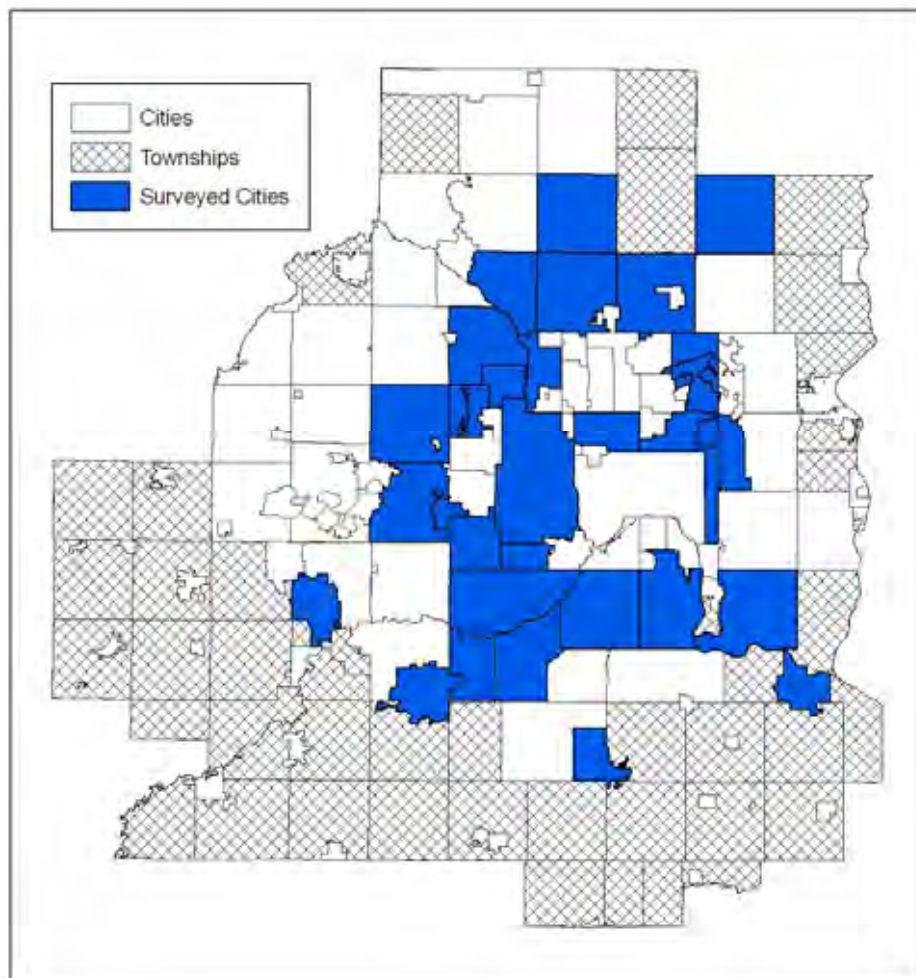
- **Biotic Impacts**

- **Rivers and Streams**
- **Lakes, Ponds, and Groundwater**
- **Toxicity Studies**
- **Impacts to Other Organisms (frogs, birds, etc.)**
- **Vegetation**
- **Soil**

- **Road Salt Additives and Contaminants**

- **Cyanide**
- **Other Additives and Impurities**

Existing Practices (Appendices H & I)



- Undertook a phone survey of 42 Metro area jurisdictions, including counties, cities, townships, and park districts
- 6/7 counties responded, and 31 cities representing 22 % of the cities in the Metro area responded
- Appendix H presents 14 categories of BMPs that are most commonly used in the United States, Canada, and Europe

*Because survey respondents were not selected randomly but were to an extent self-selected, survey results should be viewed simply as a cross-section of practices, and not necessarily representative of all road authorities in the TCMA

Telephone Survey (Appendix I)

#	Question
1.	Do you have a written snow and ice control plan or manual?
2.	What ice control materials and products do you use?
3.	Have you ever used alternate products such as Clear Lane, Ice Ban, magnesium or calcium chloride?
4.	What did you use? How did it work for you? If the experience was positive, what is standing in the way of continued use?
5.	Do you target specific locations or infrastructure where you use some other product or mix (e.g., spray salt solution on bridge decks)?
6.	Do you pre-wet road salt before application?
7.	Do you use technology such as road temperature sensors or electronic application control to set or refine application rates? What do you use?
8.	Can your equipment be adjusted or calibrated to adjust the application rate based on the situation?
9.	Who calibrates your spreaders and how often are they calibrated?
10.	Do your operators have discretion in setting application rates? If yes, how do they determine the appropriate rate?
11.	Do your operators receive specific training on snow and ice control? If yes: Where do they get the training? Does everyone receive training? If no: Who does receive it?
12.	Do you track application rates or salt use? If yes: What specifically do you track? If yes: Do you use that data to manage or plan for snow and ice control?
13.	How is the salt stored? Please describe your storage facility. Can you describe your loading and delivery practices?
14.	Do you sweep your streets? If yes: How often do you sweep streets? What time of year? What kind of equipment do you use?
15.	Are you considering any changes to your current snow and ice management practices in the next 3 years? If yes: What are they?
16.	Is there any other information you would like to share with us about your snow and ice management programs?

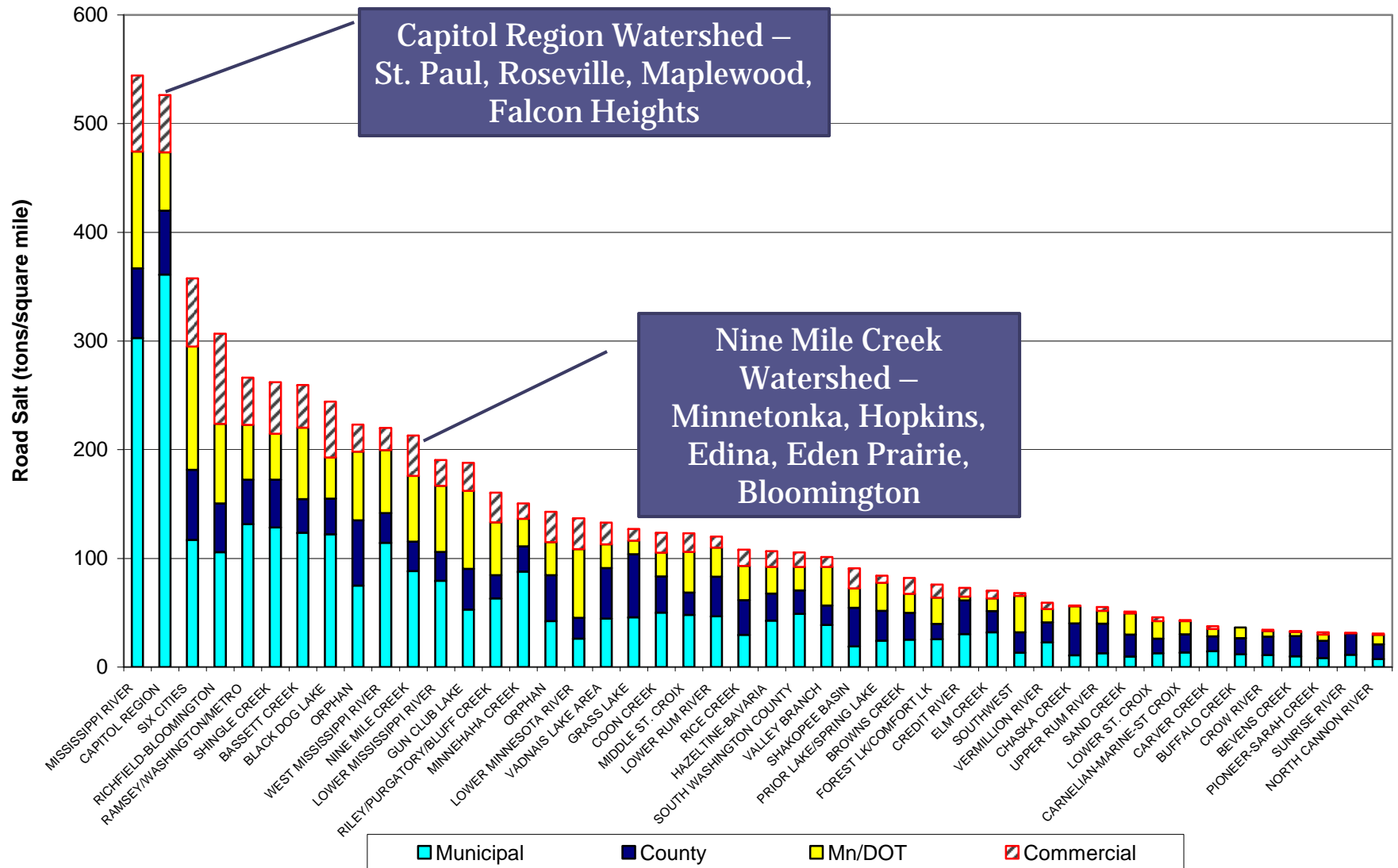
Best Management Practices (Appendix H)

Practice	Summary Description	Used in Metro area?	Other Comments
1. Enhanced staff training and housekeeping	<p>Training is aimed mostly at applicators and includes the appropriate winter operation programs for ice and snow control and the role/uses/operation of new technology and approaches. Among other items, training programs emphasize:</p> <ul style="list-style-type: none">• Improving operator understanding of how the different ice and snow control chemicals work.• Appropriate application rates and techniques.• Not over-loading material spreaders to avoid spillage.• Control of spreading speeds to reduce bounce and scatter.• Returning un-used materials to stock piles.• Avoidance of heavy “end of beat” applications just to empty the load.• Controlling spread patterns to concentrate material where it is most effective.	Yes, the Local Technical Assistance Program LTAP is the main source of quality training for most organizations	Other training or information sharing resources are the annual Road Salt Symposium, Snow Roadeo, voluntary Operator Certification training through the MPCA.

Road Salt Source Assessment

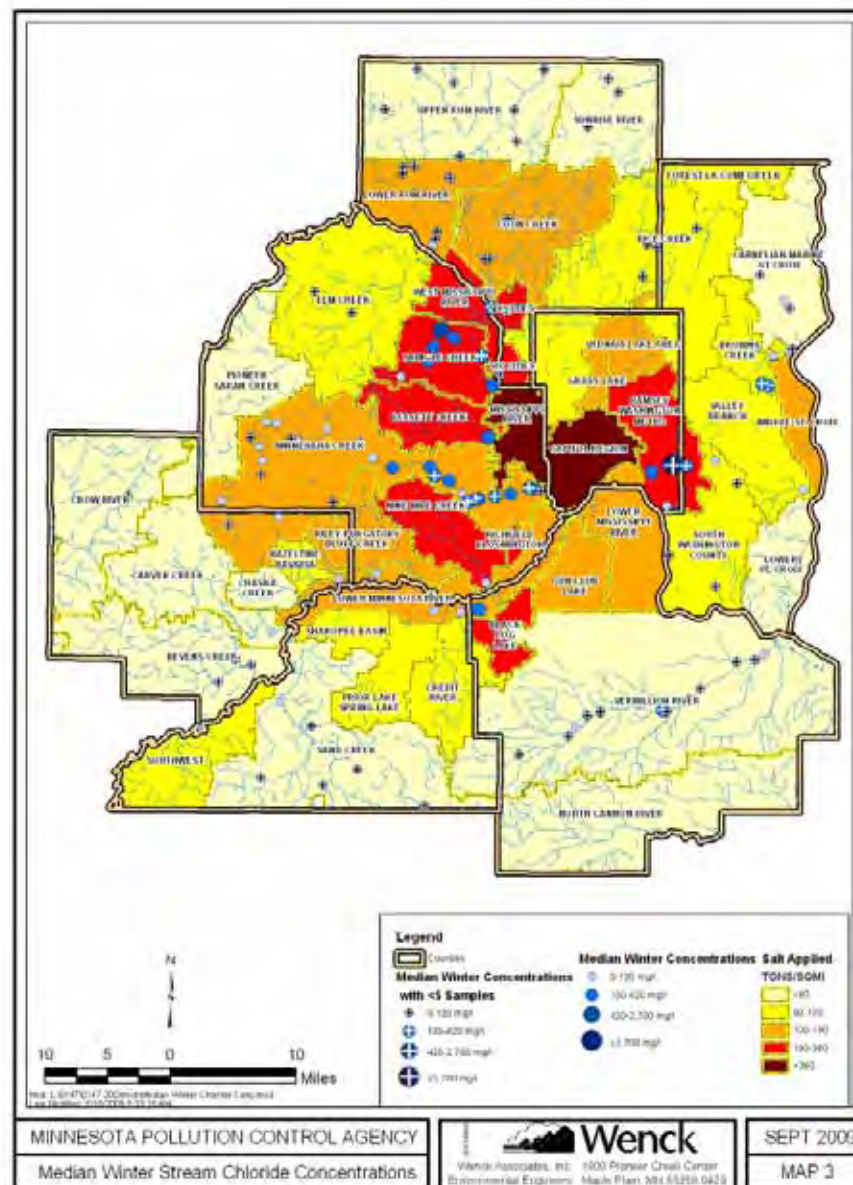
- 4 primary sources identified: Mn/DOT, Counties, Municipalities, and Private Applicators
- Previous study by SAFL (Sander et al. 2007) compiled road salt use in the TCMA using purchasing records (years 2001-2006)
- Combined average annual application mass with lane mile information provided by Mn/DOT

Road Salt Application Rates



Relationships – Road Salt & Water Quality

- The best predictor of chloride concentration in streams is road salt application rates
- Road density is also positively correlated with median winter chloride concentrations
- Median winter chloride concentrations appear to increase with road densities greater than 25 lane miles per square mile



Summary of Available Data & Data Gaps

- **Streams**

- Only 13/43 watersheds had relatively robust winter data sets (greater than 50 samples)

- **Lakes**

- Lack of winter data
- Limited number of deep lake samples

- **Potential Sources**

- Need private application rates
- Need more accurate tracking of road salt application rates (used salt purchases)

Research Needs

- Analyze de-icing material impacts on lake biota and lake mixing
- **Assess potential chloride BMPs for their effectiveness and cost of reducing chloride delivery to waterbodies**
- Examine how increased stormwater infiltration may impact surface and groundwater chloride concentrations
- Examine how increased chloride may impact soil structure, soil loss and infiltration rates in the TCMA

Potential Chloride Management Strategies

- **Management Approach**

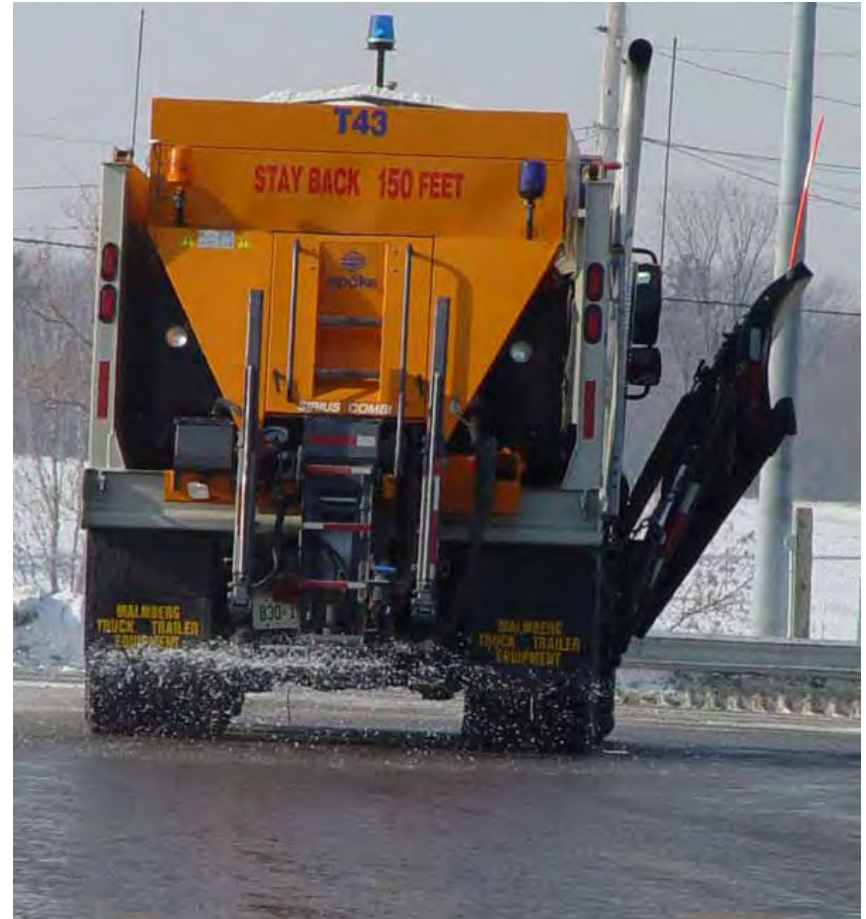
- Create and manage a statewide database of road salt and alternative products used in Minnesota
- Create policies/regulations that reduce chloride delivery to waterbodies in sensitive areas such as reducing speeds during snow/ice events
- Financial incentives could be made more generally available to assist road authorities and private applicators with adopting BMPs

Potential Chloride Management Strategies

- **Total Maximum Daily Load Approach**
 - Metro-wide Chloride TMDL
 - Pro – cost effective and fair
 - Con – limited data for traditional TMDL
- **Regulatory Approach**
 - Include mandatory chloride-reduction BMPs in the next state NPDES MS4 General Permit
 - Specific stockpile management strategies
 - Compile and report application of chloride-based de-icers and alternative materials

TCMA Chloride Project Phase 2

- A combination of all 3 strategies from feasibility study
- Conducting winter monitoring throughout the TCMA
- Work Plan is currently under development for a TCMA Chloride Management Plan



Phase 2 Goals

- Develop chloride monitoring guidance
- Fill water quality data gaps
- Obtain application rates instead of purchasing records
- Gain better understanding of private applicator rates
- Develop general educational tools regarding road salt and water quality
- Define priority areas in the TCMA
- Fulfill TMDL requirements for waters already impaired
- Develop protection plan for waters still meeting standards
- Develop implementation plan that all road authorities can use

What Can You Do?

Participate in our Stakeholder group

Share your ideas and challenges for reducing road salt use

Spread the word about road salt trainings



Minnesota
Pollution
Control
Agency

THANK YOU!

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<http://www.pca.state.mn.us/water/tmdl/project-chloride-metro>